distinct amount of pressure applied to the softkey 36b-i. This distinct amount of pressure is detected by the controller in communication with the touchpad 30. Alternatively, the apparatus can include a separate pressure calculator to measure the amount of pressure applied to the touchpad 30 . In the embodiment shown, the amount of pressure applied to the touchpad 30 is calculated by the controller based upon the amount of area of the object 24 used to select the softkey that is in contact with the surface 35 of the touchpad 30.

[0057] The amount of pressure applied to the input device or to the softkey 36a-i on the touchpad can be determined by reading or determining the size or area of the contact patch created by the object 24, such as the user"s finger, on the input device or softkey 36a-i. In addition to reading the current size of the contact patch, the rate of change of the contact patch can also be determined, using dynamic thresholds and to look at how fast the user"s pressure is changing. If the contact patch area changes at a sufficiently large rate, the controller can determine that the corresponding input device or softkey 36a-i is being selected.

[0058] The functionality of the softkeys shown in **Fig. 5** is similar to the mechanical key counter parts described in relation to **Figs. 2 and 3**. Therefore, the pressure level of a selected softkey may be moveable from a first position to a second position upon the application of a sufficient amount of pressure. The amount of pressure necessary to move the softkey 36a to the second position (the first position being at rest or no contact) input device to the first position is about equal to the amount of pressure that user"s finger would exert upon contact with the touchpad surface and sliding lightly along the surface. In this embodiment, the controller is configured to cause the actuator to produce a first tactile sensation when the softkey 36a is in the second position or when the applied pressure is less than the amount of pressure necessary to indicate that the softkey has been selected, that is the third position. The controller would then cause the actuator 64 to produce a second tactile sensation upon receipt of the input signal associated with the third position or upon detection of a sufficient amount of pressure applied to the softkey 36a. The softkey 36i has five positions associated with four distinct applied pressures and no pressure at the softkey 36i, and corresponding to the input signals for the letters W, X, Y, and Z. A dwell to select feature can be used to determine the desired position and associated input signal.

[0059] This functionality facilitates a user moving an object over the various softkeys displayed on the input device and receiving a specific frequency or tactile sensation to signal that a particular softkey has been touched. As the object 24 contacts other softkeys in the display matrix, additional distinct tactile sensations unique to these other softkeys are produced. With continued use, the user can quickly become accustomed to the various distinct tactile sensations and the associations between sensations and specific softkeys, permitting identification and selection of softkeys or buttons by touch alone. In fact, distinct tactile sensations can be used with the same button regardless of the electronic device, creating a universal tactile sensation library similar to for example, a busy signal providing a universal auditory signal that a telephone number is unavailable regardless of the type of telephone equipment used. For example, a distinct tactile sensation can be played when the object is in contact with the "5"key, providing a "home" key indication. In addition, keys located on the center axis can have a single "pop" while keys in the columns to the left and right of the center axis have two "pops", providing an indication of the general location of the object 24 in a keypad matrix.

[0060] In another example, if the user is moving the object 24 over the "9"key, a relatively high frequency vibration can be output on all the keys. When the pressure associated with the object is detected at the "6" key, a lower frequency vibration can be output, allowing the user to determine which key is presently in contact with the object through the sense of touch. Since it is unlikely that a user would press or contact more than one softkey simultaneously, a single vibrotactile actuator outputting the same sensation to all of the buttons simultaneously can be used. When the user applies increased pressure to a softkey with the object 24 and that pressure is greater than a predetermined threshold pressure level, the function associated with that softkey is activated.

[0061] **Fig. 7** is a block level diagram illustrating a representative embodiment of the present invention. The various components communicate across a common communication bus 39. The input devices 40 produce input signals in accordance with the present invention, and the input signals are communicated to the controller 41 across the communication bus 39. The controller 41 can also receive pressure or position information regarding the input devices associated with the received input signal. Based upon the received input signal, pressure and position data, the controller accesses a memory 42 to obtain the necessary data regarding the functionality and tactile feedback associated with the received input signal. In addition, the controller 41 can update data stored in the memory as for example when the input signal relates to changing the functionality or input options associated with the input device that produced the input signal. Based upon the received functionality, the controller delivers a function signal to the electronic device 43 to which the apparatus is connected. In addition, the controller 41 modifies the output on the display 44 in particular where the display is part of the input device, such as when a touchpad is used. Alternatively, the electronic device controls and updates the display. In addition, the controller can be the CPU associated with the electronic device, and the memory can be the memory associated with the electronic device. The arrangement of the controller, memory and display depends upon whether or not the apparatus is constructed as a standalone device that can be retrofitted into an existing electronic device or is incorporated into the electronic device itself. The controller uses the tactile feedback information received from the memory to provide the necessary input to control circuitry 45 to drive the actuator 46 to produce the desired tactile sensation in the appropriate input device.

[0062] Referring to **Fig. 8**, a flow chart illustrating a method of producing a tactile feedback sensation in an input device according to the present invention is illustrated. A controller monitors an input device in an apparatus 47. When a plurality of input devices are included in the apparatus, the controller can either monitor each input device sequentially or in parallel. Although illustrated as a single pass function, monitoring of the input devices is preferably handled as a continuous loop function.